

NAME OF SPECIES: Thousand cankers disease of black walnut	
Synonyms:	
Common Name: walnut twig beetle, <i>Pityophthorus juglandis</i> and associated fungus, <i>Geosmithia morbida</i>	
A. CURRENT STATUS AND DISTRIBUTION	
I. In Wisconsin?	1. YES NO X
	2. Abundance:
	3. Geographic Range:
	4. Habitat Invaded:
	5. Historical Status and Rate of Spread in Wisconsin:
	6. Proportion of potential range occupied:
II. Invasive in Similar Climate Zones	YES X NO United States: Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Tennessee, Utah and Washington, Tennessee is the only state east of the Mississippi R with a confirmed infestation Canada: Other: Mexico (beetle only). Origin of fungus is unknown
III. Invasive in Similar Habitat Types	YES X NO Has infected ornamental trees from southwest to northwest US and as far east as TN, from parks and national forests to highway ROWs to germplasm reserves, has not yet reached temperate climates
IV. Habitat Affected What has happened elsewhere and what could happen here?	1. Host plants: eastern black walnut <i>Juglans nigra</i> , also found in California on <i>J. regia</i> (english walnut), <i>J. californica</i> , <i>J. microcarpa</i> , <i>J. mollis</i> , <i>J. hindsii</i> , <i>J. major</i> , and <i>J. mandshurica</i>
	2. Conservation significance of threatened habitats: Could eliminate walnut in WI
V. Native Habitat	1. Countries: beetle is native to CA and probably AZ and NM as well as northern Mexico; origin of fungus is unknown
	2. Hosts: eastern black walnut
VI. Legal Classification	1. Quarantined species? YES X NO
	2. By what states, countries? Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Tennessee, Utah, Washington, Wisconsin (temporary rule #11-001), Indiana, Kansas, Michigan, Missouri, Minnesota, Nebraska, North Carolina and Oklahoma
B. ESTABLISHMENT POTENTIAL AND LIFE HISTORY TRAITS	
I. Life History	1. Type of insect: Coleoptera
	2. Time to Maturity: 2 or more generations per year (usually less than 2 months per generation)
	3. Methods of Spread: fungus is beetle vectored; beetles are transported on raw wood, scion wood, firewood ; local spread by beetle flight
II. Climate	1. Climate restrictions: unknown, but beetle and fungus are able to survive a wide range of climactic conditions in the west, from coastal Oregon to mountainous areas of Colorado to dry climates of Arizona and New Mexico
	2. Effects of potential climate change: as with other beetle-vectored diseases, warmer climates may lead to an increased number of generations per year and increased overwintering survival

III. Dispersal Potential	<p>1. Invasion pathways: Most likely path is the movement of raw wood (green lumber, logs, stumps, roots, branches, chips) and packing materials. Also nursery stock, scion wood for grafting, firewood, as well as natural spread, especially along riparian zones.</p> <p>2. Distinguishing characteristics that aid in its survival and/or inhibit its control: since the beetles and their exit holes are tiny as are the initial cankers, it may take several years before they are recognized. By this time, it's too late to save the tree and probably to prevent dissemination of beetle Walnut twig beetle is polyphagous and can reproduce in more than 10 species of Juglans. The beetle is a very efficient vector of J. hindsii and J. californica</p>				
IV. Ability to go Undetected Insect:/eggs/larvae/pupa, what do they look like, when do you see them and where Damage:	<table><tr><td>HIGH</td><td>X</td><td>MEDIUM</td><td>LOW</td></tr></table> <p>Signs and symptoms: Fatal to all <i>Juglans nigra</i> Branch yellowing on walnuts progresses rapidly to wilted foliage and branch mortality. The walnut twig beetle is minute (1.5-1.9mm) and hard to see. The beetle tunnels under bark in branches and occasionally the trunk of trees. Adults initiate tunnels by early May and introduce <i>Geosmithia morbida</i> fungus which grows in advance of the beetle. The fungus produces distinctive circular dark cankers in the phloem under the bark surrounding the nuptial chambers. These cankers expand rapidly, especially longitudinally. Multiple cankers coalesce and eventually girdle branches causing dieback. The number of these cankers is enormous. The bark surface may have no symptoms or staining/cracking of the bark. There are usually numerous tiny beetle exit holes in dead and dying branches. The fungal species, <i>Geosmithia morbida</i>, appears to be more virulent than related species. It requires culturing on media for identification. The fungus doesn't grow systemically in the tree as does Dutch elm disease. Damage: It usually takes about 3 yrs for trees to die from the cumulative effects of so many coalescing cankers, the disruption of nutrient flow through phloem tissue.</p>	HIGH	X	MEDIUM	LOW
HIGH	X	MEDIUM	LOW		
C. DAMAGE POTENTIAL					
I. Competitive Ability What are potential results of tree mortality?, changes in stand composition, increase other populations?	<p>1. Presence of Natural Enemies: Predators: several known in CA including <i>Temnochila chlorodia</i> Pathogens: Unknown Parasitoids: : several known in CA including <i>Neocalosoter sp.</i>, and <i>Plastanoxus westwoodi</i></p> <p>2. Presence of Competitors:</p> <p>3. Rate of Spread: fast</p>				
II. Environmental Effects	<p>1. Alteration of ecosystem/community composition? YES X NO Notes: elimination of black walnut, a valuable tree which is especially abundant in SW Wisconsin (60% of all black walnut in the state)</p> <p>2. Alteration of ecosystem/community structure? YES X NO Notes: Walnuts are a major mast species for wildlife.</p> <p>3. Alteration of ecosystem/community functions and processes? YES NO Notes:</p>				
D. PREVENTION AND CONTROL					
I. Detection Capability:	<p>Notes: Difiicult, Takes a long time to notice symptoms. Cankers are often small and hard to see. Branch inspection of dieback is the best method and submission for analysis. Sticky traps, may be used to catch adults as they move into lower trunk to</p>				

	overwinter (mid-July to late August) Pheromone based traps are being developed for use in detection
II. Costs of Prevention :	Notes: Quarantine would not inflict much of an economic burden on the state and by preventing the introduction of this disease, might save a species that is very important economically. Finished wood products and nuts would not be effected by the quarantine.
III. Responsiveness to prevention efforts: do these prevention methods work?	Notes: Since walnut is very susceptible to TCD, quarantine is our most effective prevention and should be very effective in keeping it out of the state.
IV. Control tactics: Avoid transport, stand improvement quarantine	Cultural: Some Juglans species and hybrids may be more resistant, Injected fertilizers may help restore tree nutrients (such as Stemix Plus). Quarantine Biological: effects of site quality and tree health appear not to matter Natural enemies of beetle: several known in CA including Temnochila chlorodia, Neocalosoter sp., and Platanoxus westwoodi Pathogens: Chemicals: Insecticide treatment of infested trees and soil has not worked. Treatments made after symptoms appear are ineffective. Trunk injected fungicides and insecticides, such as ArborFos and Imicide, may be the only effective way to eliminate the disease.
V. Minimum Effort:	Notes: Quarantine, Detection and rapid removal of diseased trees
VI. Most Effective Control: Best method?	Notes: Systemic fungicides, insecticides and tree nutrient injections for selected high value trees.
VII. Cost of prevention or control vs. Cost of allowing invasion to occur: Cost to industry? Urban? Environment?	Notes: Walnut is an extremely important species in Wisconsin, ecologically and economically. There are about 19.7 million trees, of which 60% are located in the southwestern part of the state. Wisconsin exports several million dollars worth of black walnut products annually. Allowing this invasion to occur would be devastating to primary and secondary mills which process and sell walnut.
VIII. Non-Target Effects of Control: Effects of insecticide on natives? Specificity of control? Of parasitoids, nematoids	Notes: Only effective treatment is systemic fungicides and insecticides which should not effect other biota.
IX. Efficacy of monitoring: effects of trapping, visual inspection	Notes: Monitoring is difficult since it takes a long time to notice symptoms. Cankers are often small and hard to see. Branch inspection of dieback is the best method and submission for analysis. Sticky traps, may be used to catch adults as they move into lower trunk to overwinter (mid-July to late August) but still difficult.
X. Legal and landowner issues:	Notes:

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